Studies of Cluster Position Correction

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Position correction method

- Define $\eta_N = \frac{\sum_i (s_i - s_m) q_i}{\sum_i q_i} = s_{centroid} - s_{max}$, for cluster size >1 strip events.

s_{max} is the strip which has maximum charge; $s_{centroid} = {\sum s_i q_i}/{\sum q_i}$ is the center of gravity position in terms of strip (cluster centroid position); N is cluster size.

- Mainly reference: (PhD thesis CERN-THESIS-2013-284 by Marco Villa).
- $|\eta_N| < (N-1)/4$ for odd N; $|\eta_N| < (N-2)/4$ for even N; $|\eta_2| < 1/2$. For N=2,3,4, η_N in the range of [-0.5,0.5], for N=5, η_N in [-1,1].
- The histogram for each selected N is regarded as a function h(η).

- The new cluster centroid position in strip is calculated event by event:

$$s'_{centroid} = s_{max} - 0.5 + \frac{\int_{-0.5}^{\eta'} h(\eta) d\eta}{\int_{-0.5}^{0.5} h(\eta) d\eta}$$

→ Use boundary -1 and 1 for N=5

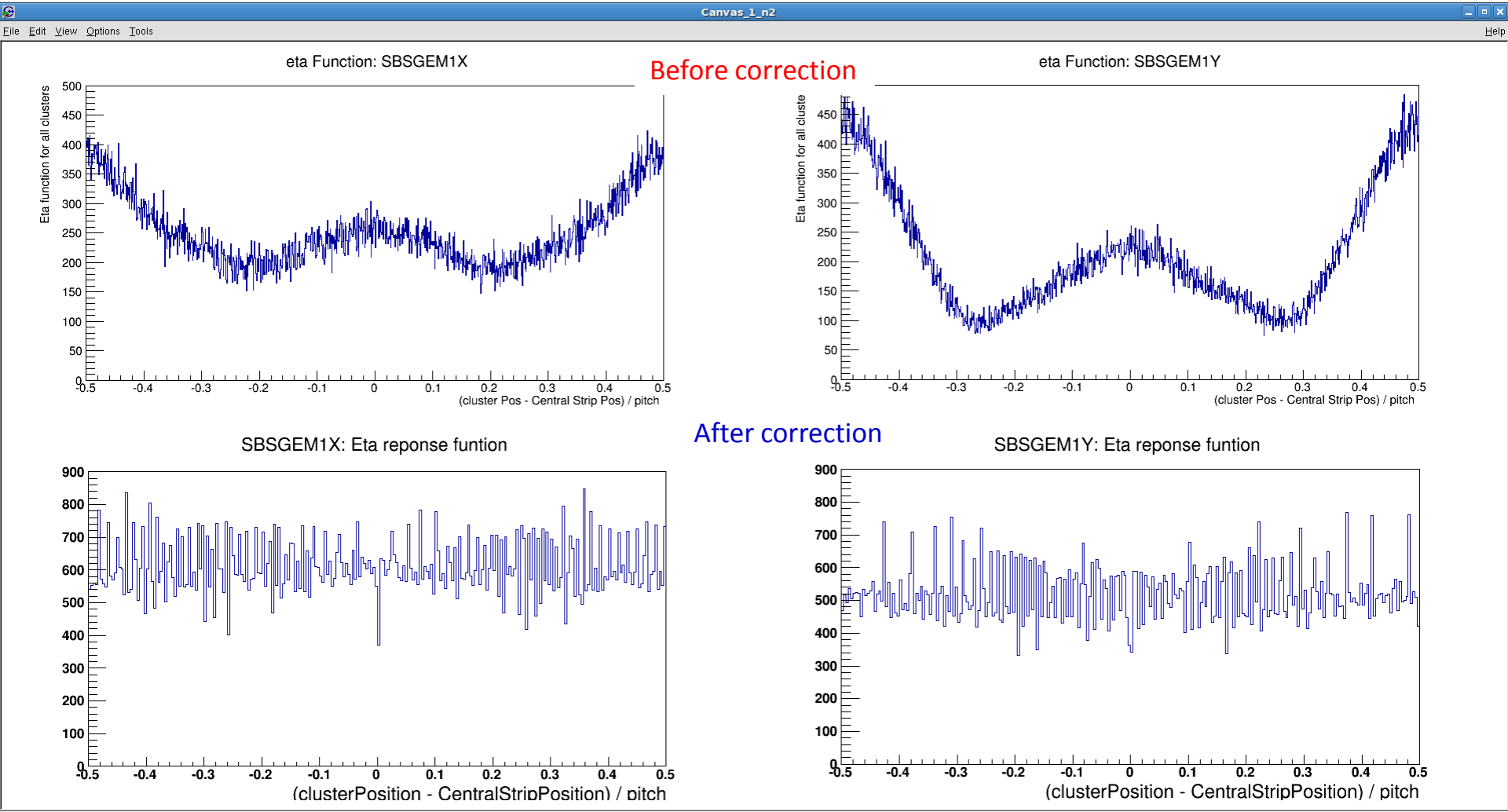
- The new cluster centroid position for tracker is calculated by:

$$x'_{centroid} = -0.5 * planeSize + stripPitch * s'_{centroid}$$

For radial zigzag / CMS GEM:

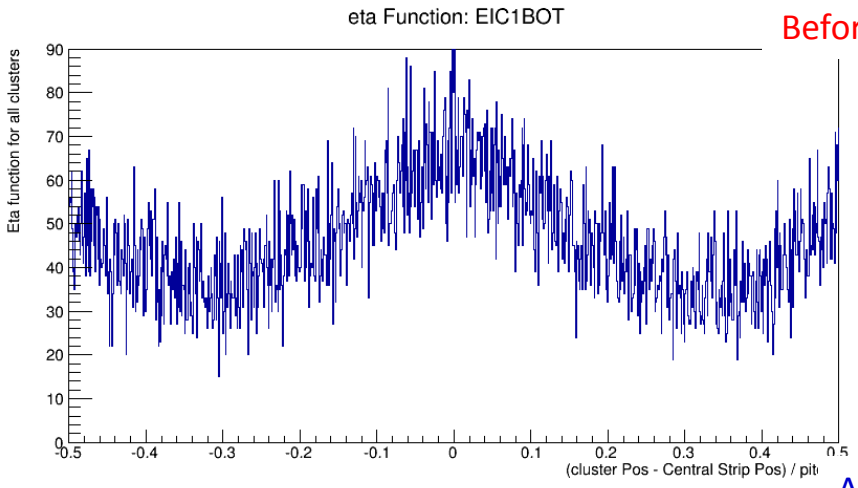
6/2/2014 $$\varphi'_{centroid} = -0.5 * openningAngle + anglePitch * s'_{centroid}$$ 3

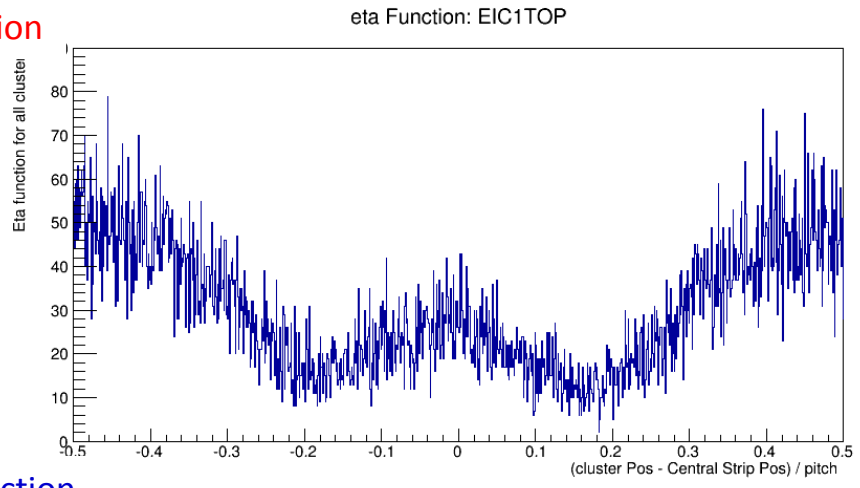
Eta distribution across the strips before and after correction for EIC



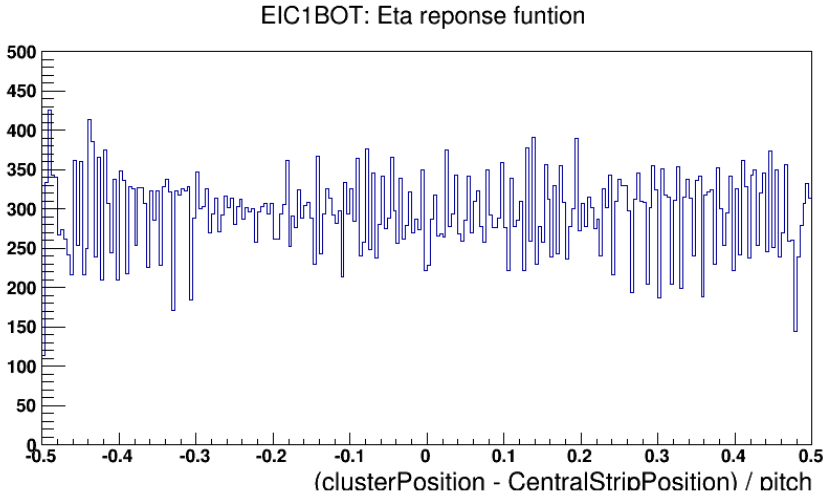
Eta distribution across the strips before and after correction for EIC

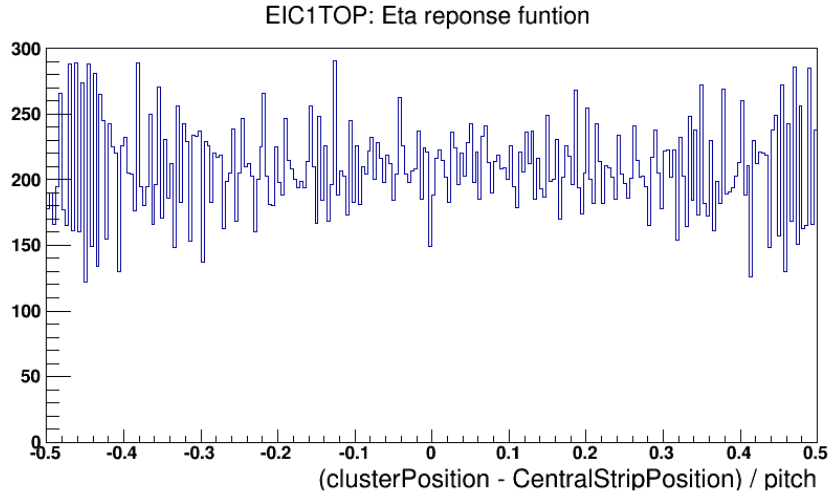
Before correction



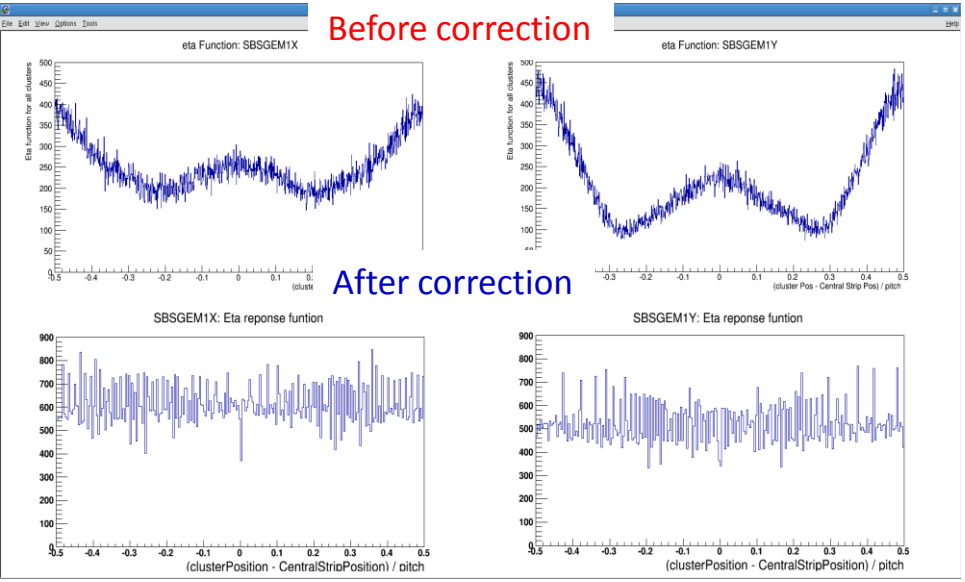


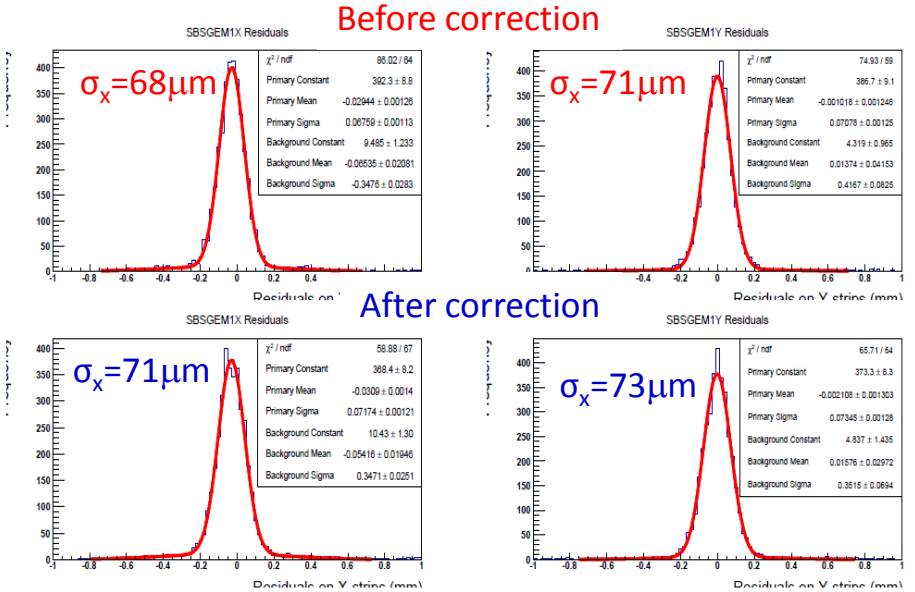
After correction

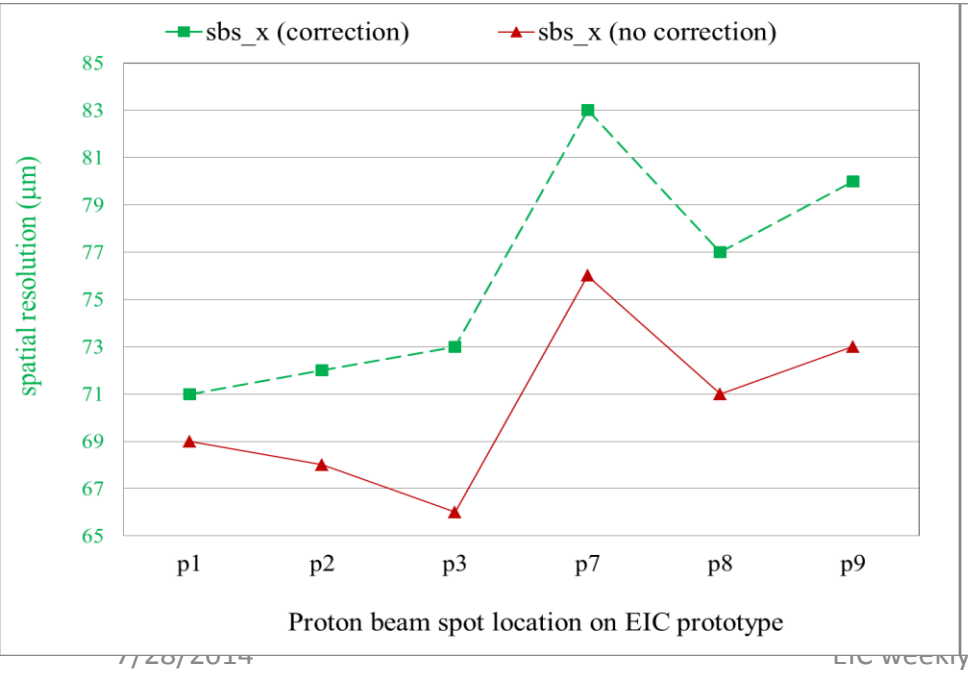


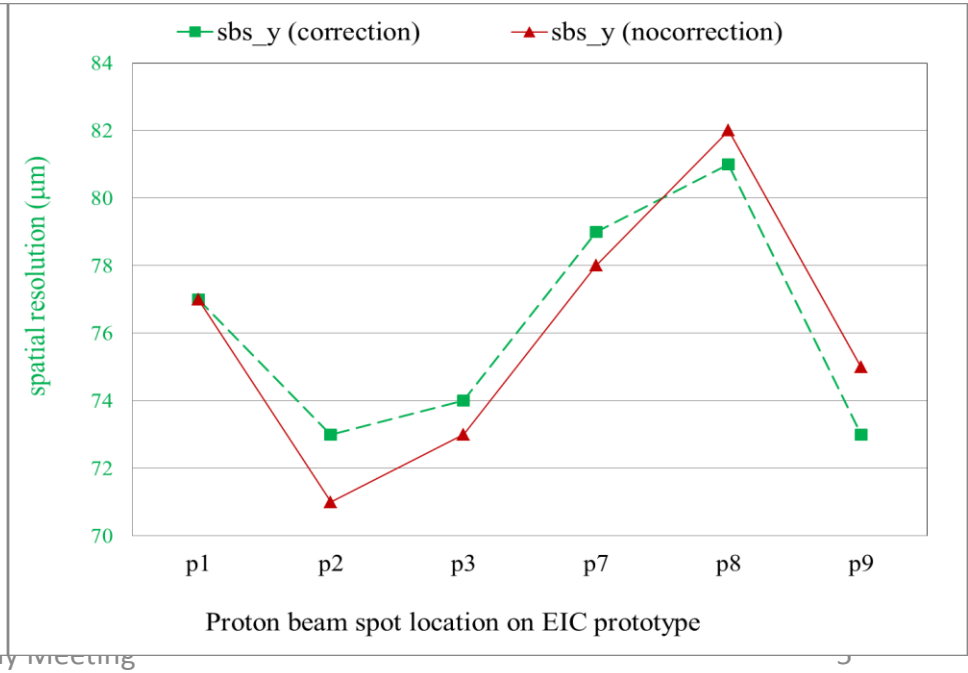


Resolution before and after correction for SBS

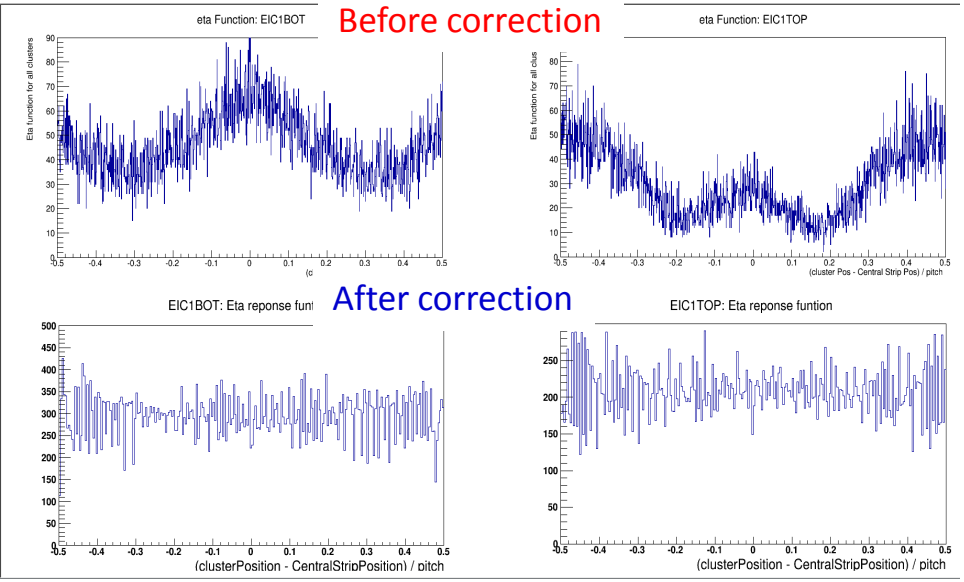


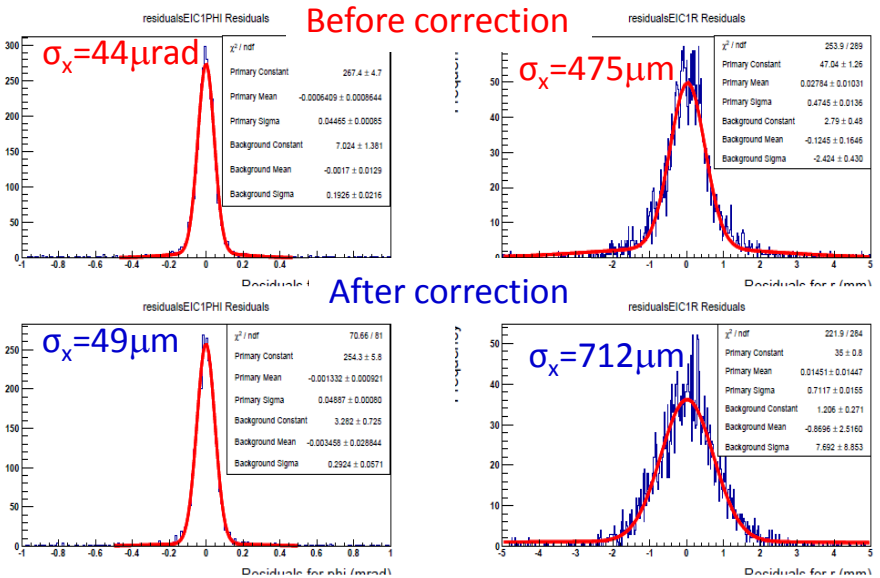


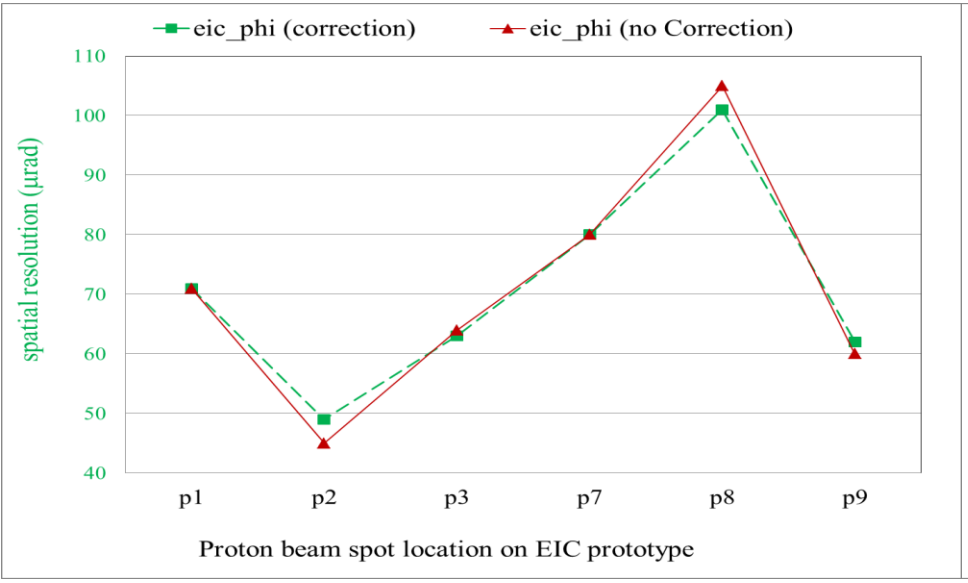


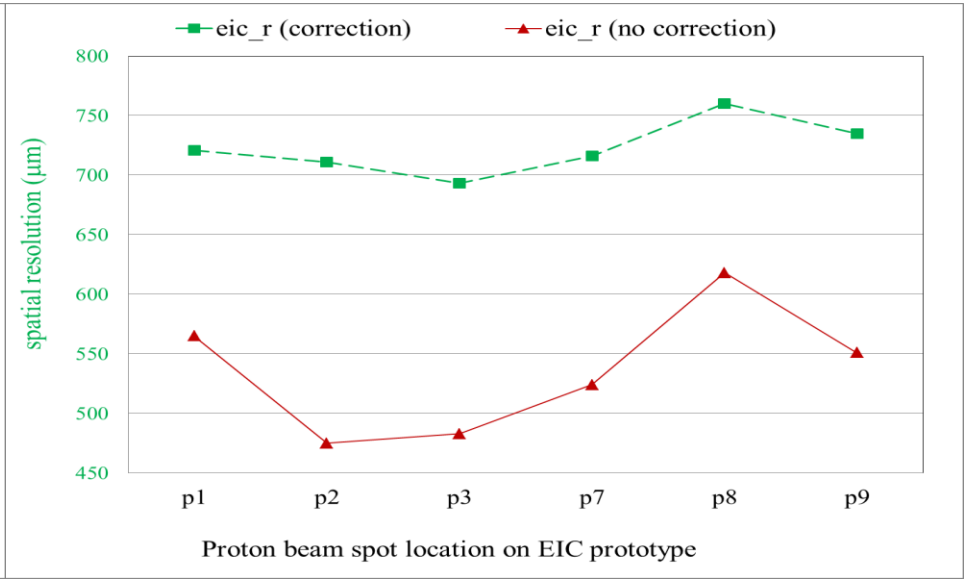


Resolution before and after correction for EIC: Polar coordinates









Resolution before and after correction for EIC: Cartesian coordinates